



1: J Infect Dis. 1985 Dec;152(6):1308-16. Links

The osmoprotective properties of urine for bacteria: the protective effect of betaine and human urine against low pH and high concentrations of electrolytes, sugars, and urea.

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Growth of *Escherichia coli* was inhibited in a defined minimal medium by high concentrations of electrolytes and sugars in direct relation to their osmotic strength. Choline, betaine, proline, and human urine increased resistance to these substances. In contrast, the toxic effect of urea was not altered directly by betaine or urine, but was reduced in the presence of other osmolytes. The osmolyte protective effect was augmented by betaine. The osmoprotective effect of betaine and urine was confirmed with 40 strains of enteric bacteria. Urine from 19 healthy subjects contained osmoprotective activity greater than that observed with betaine. A methanol extract of urine was found to be highly protective. Although betaine was present in the extract, it could not account for all the protective activity. Urine contains additional low-molecular-weight osmoprotective agents.

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